AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1-26. (cancelled).

27. (new) A polarimetric system for analyzing a sample comprising:

an excitation section emitting a light beam, said excitation section comprising a polarization state generator containing a polarizer polarizing an incident light beam linearly along a direction of polarization;

an analysis section comprising a polarization state detector containing an analyzer analysing a light beam linearly along a direction of analysis;

detection means; and

a processing unit, wherein,

said polarization state generator comprises first and second liquid crystal elements, the second liquid crystal element being nearer an exit of the polarization state generator than the first liquid crystal element, each polarization state generator liquid crystal element having i) an extraordinary axis defining an orientation angle with respect to the direction of polarization, and ii) an ordinary axis defining a retardation with respect to the extraordinary axis,

said polarization state detector comprises first and second liquid crystal elements, the second liquid crystal element being nearer an entry of the polarization state detector than the first crystal element, each polarization state detector liquid crystal element i) an extraordinary axis defining an orientation angle with respect to the direction of polarization, and ii) an ordinary axis defining a retardation with respect to the extraordinary axis,

the orientation angles of the first and second polarization state generator liquid crystal elements are equal to the orientation angles of the respective first and second polarization state detector liquid crystal elements, and

the retardations of the first and second polarization state generator liquid crystal elements are equal to the retardations of the respective first and second polarization state detector liquid crystal elements, modulo 2π.

28. (new) A polarimetric system according to claim 27, wherein,

said liquid crystal elements are nematic liquid crystals, and

the polarimetric system further comprises an electronic control unit enabling polarization modulation by varying the retardations for the nematic liquid crystals.

29. (new) A polarimetric system according to claim 27, wherein,

said liquid crystal elements are ferroelectric liquid crystals, and

the polarimetric system further comprises an electronic control enabling polarization modulation by varying the orientation angles for the ferroelectric liquid crystals.

30. (new) A polarimetric system according to claim 27, wherein,

a couple of the retardations (δ_1, δ_2) is varied in a sequence (Δ_1,Δ_1), (Δ_1,Δ_2), (Δ_2,Δ_1), (Δ_2,Δ_2),

where Δ_1 and Δ_2 verify the formulae $\Delta_1 = 315° + p\ 90°$ and $\Delta_2 = 135° + p\ 90°$ respectively, where p is the same integer in both formulae, with a tolerance of +/- 20°,

the orientations angles verify the formulae $\theta_1 = \varepsilon\ 27° + q\ 90°$ and $\theta_2 = \varepsilon\ 72° + r\ 90°$ respectively, where $\varepsilon = \pm 1$ has the same value in both equations while q and r are any integer, with a tolerance of +/-10°.

31. (new) A polarimetric system according to claim 27, wherein,

the orientations of the extraordinary axes are set sequentially to ($\theta 1$, $\theta 2$), ($\theta 1+45°$, $\theta 2$), ($\theta 1$, $\theta 2+45°$), ($\theta 1+45°$, $\theta 2+45°$),

the retardations verify $\delta 1=80°+/-15°$ and $\delta 2=160°+/-15°$, and

the orientation angles are given by $\theta 1 = 67°+/-10°$ and $\theta 2 = 160°+/-40°$.

32. (new) A polarimetric system according to claim 31, wherein,

the polarimetric system is configured for a range of wavelengths,

a fixed retardation plate is located between said first and second liquid crystal elements in the polarization state, and

a fixed retardation plate is located between said first and second liquid crystal elements in the polarization state generator.

33. (new) A polarimetric system according to claim 32, wherein,

said polarimetric system is optimized for the spectral range from 420 nm to 800 nm, and

the retardation plate is a quartz plate, and

the polarization state generator comprises

said linear polarizer with the orientation angle set equal to zero,

said first ferroelectric liquid crystal with the retardation δ_1=90°+/-5° at 510 nm and the orientation angle set equal to -10°+/-5°,

said quartz retardation plate providing a retardation δ_Q=90°+/-5° at 633 nm with an orientation angle set equal to 5°+/-5°, and

said second ferroelectric liquid crystal providing a retardation δ2=180°+/-15° at 510 nm with an orientation angle set equal to 71°+/-10°.

34. (new) A polarimetric system according to claim 27, wherein said polarimetric system is an ellipsometer.

35. (new) A polarimetric system according to claim 27, wherein said polarimetric system is a Mueller polarimetric system for analyzing a sample through the measurement of the sixteen coefficients of the sample's Mueller matrix.

36. (new) A polarimetric system according to claim 27, wherein the light beam emitted by the excitation section is in the spectral range 400-1500 nm for nematic liquid crystals, and 420-800 nm for ferroelectric liquid crystals.

37. (new) A polarimetric system according to claim 27, wherein the excitation section comprises a monochromator positioned before the polarization state generator.

38. (new) A polarimetric system according to claim 37, wherein the detection means comprises a monochromator, placed after the polarization state detector.

39. (new) A polarimetric system according to claim 27, wherein the detection means comprises a multipoint photosensitive detector, adapted with the processing unit to polarimetric imaging.

40. (new) A polarimetric system according to claim 39, wherein the multipoint photosensitive detector is a charge coupled detector.

41. (new) A calibration process of a polarimetric system adapted to the complete Mueller polarimetry in transmission of a sample, comprising the steps of:

using a polarimetric system that comprises

i) a polarisation state generator modulating an incident light beam polarization, the generator containing a polarizer, first and second liquid crystal elements positioned after the polarizer, the second liquid crystal element being nearer an exit

of the polarization state generator than the first crystal element, each of said liquid crystal elements having a retardation between an ordinary axis and an extraordinary axis and said extraordinary axis making an orientation angle with respect to the polarization direction defined by the linear polarizer, where varying the retardation of each liquid crystal element for a fixed value of the orientation angle, when the liquid crystal elements are nematic liquid crystals or by switching the orientation angle when the liquid crystal elements are ferroelectric LCs, one modulates the incident light beam polarization, the polarization state generator having a non-singular modulation matrix **W**, and

ii) a polarization state detector polarization state detector containing an analyzer, detection means, and first and second liquid crystal elements positioned before the analyser, the second liquid crystal element being nearer the entry of the polarization state detector than the first crystal element, each of said liquid crystal elements having a retardation between an ordinary axis and an extraordinary axis and said extraordinary axis making an orientation angle with respect to the direction of analysis of the analyser, said liquid crystal elements being the same as the liquid crystal elements of the polarization state generator, so that by varying the retardation of each liquid crystal element for fixed values orientation angles when the liquid crystals are nematic liquid crystals, or by switching the values of orientation angles for fixed retardation when the liquid

crystals are ferroelectric liquid crystals, one generates a non-singular detection matrix **A**;

choosing a set of reference sample elements comprising dichroïc retarders with approximately known Mueller matrices, defined by the parameters τ_p, Ψ_p and Δ_p, one of the reference sample elements being the identity matrix $\mathbf{I}_o$ representing propagation in air; and

for each of the reference sample elements taking a complete measurement of said reference sample element set at an orientation angle by

i) illuminating said each reference sample element with said polarized incident light beam emitted by said polarization state generator,

ii) detecting a measurement beam transmitted by said each reference sample element with an analysis section comprising said polarization state detector and said detection means, so that for a given set of retardationsor for a given set of orientation angles one produces a measured quantity;

iii) processing the electrical signals produced by the detection means in accordance with the measured quantity with a processing unit to construct the matrix $(\mathbf{A}\mathbf{R}(-\theta_p)\mathbf{M}_p\mathbf{R}(\theta_p)\mathbf{W})$, this matrix being a product of the detection matrix **A**, the Mueller matrix $\mathbf{R}(-\theta_p)\mathbf{M}_p\mathbf{R}(\theta_p)$ of said reference sample element set at the angle θ_p, with $\mathbf{R}(\theta)$ a matrix describing a rotation by an angle θ about the z axis and the modulation matrix **W**,

iv) calculating the product $(\mathbf{AI_oW})^{-1}(\mathbf{AR}(-\theta_p)\mathbf{M_pR}(\theta_p)\mathbf{W})$ for each reference sample element in order to obtain an experimental matrix $\mathbf{C}_p$,

v) determining the actual values of τ_p, Ψ_p and Δ_p, and thus the matrix $\mathbf{M}_p$, independently of the angles θ_p, from eigenvalues of the experimental matrix $\mathbf{C}_p$,

vi) constructing a matrix $(\mathbf{K}_{tot}(\theta_p))$ equal to $\sum_p (\mathbf{H}_p(\theta_p)^T\mathbf{H}_p(\theta_p))$ where the matrix $\mathbf{H}_p(\theta_p)$ is defined as $\mathbf{H}_p(\theta_p)[\mathbf{X}] = \mathbf{R}(-\theta_p)\mathbf{M}_p\mathbf{R}(\theta_p)\mathbf{X}-\mathbf{XC}_p$ where $\mathbf{X}$ is any real 4x4 matrix,

vii) determining eigenvalues $\lambda_{i=1,16}$ of the $\mathbf{K}_{tot}(\theta_p)$ matrix in order to extract the modulation matrix $\mathbf{W}$ that verifies $\mathbf{K}_{tot}(\mathbf{W})=0$, the reference sample element being chosen so that one and only one eigenvalue λ_i vanishes when the angles θ_p used in the calculation of $\mathbf{K}_{tot}(\theta_p)$ are set equal to their actual values during the calibration measurements, while the other eigenvalues λ_j, being sorted in decreasing order of value, verify $Z=\lambda_{15}/\lambda_1 < 1$ and the ratio Z is maximised,

viii) determining the angles θ_p by requiring one of the eigenvalues $\mathbf{K}_{tot}(\theta_p)$ to vanish, $\mathbf{W}$ being the associated eigenvector, and

ix) determining the detection matrix $\mathbf{A}$ by constructing the product $(\mathbf{AI_oW})(\mathbf{W}^{-1})$.

42. (new) A calibration process according to claim 41, wherein a set of reference sample elements comprises:

a linear polarizer set at $\theta_1=0°$ orientation,

a linear polarizer set at $\theta_2 = 90° +/- 5°$ orientation, and

a retardation plate with a retardation $\delta=110°+/-30°$ set at $\theta_3=30°+/-5°$.

43. (new) A calibration process according to claim 42, wherein the retardation plate is an achromatic quarterwave plate.

44. (new) A calibration process of a polarimetric system adapted to the complete Mueller polarimetry in reflection of a sample, comprising the steps of:

using polarimetric system comprising

a polarisation state generator modulating an incident light beam polarization, containing a polarizer, a first and a second liquid crystal elements positioned after the polarizer, the second liquid crystal element being nearer the exit of the polarization state generator than the first crystal element, each of said liquid crystal element having a retardation $\delta_{j=1,\ 2}$ between an ordinary axis and an extraordinary axis and said extraordinary axis making an angle $\theta_{j=1,2}$ with respect to the polarization direction defined by the linear polarizer, where, by varying the

retardation δ_j of each liquid crystal element for a fixed value of the angle θ_j, when the liquid crystal elements are nematic liquid crystals, or by switching the orientation angle θ_j when the liquid crystal elements are ferroelectric liquid crystals, one modulates the incident light beam (2) polarization, the polarization state generator having a modulation matrix **W** that is non singular, and

a polarization state detector containing an analyzer, detection means, and first and second liquid crystal elements positioned before the analyser, the second liquid crystal element being nearer the entry of the polarization state detector than the first crystal element, each of said liquid crystal elements having a retardation $\delta'_{j=1,\,2}$ between an ordinary axis and an extraordinary axis and said extraordinary axis making an angle $\theta'_{j=1,2}$ with respect to the direction of analysis of the analyser, said liquid crystal elements being the same as the liquid crystal elements of the polarization state generator, so that by varying the retardation δ'_j of each liquid crystal element for fixed values of angles θ'_j when the liquid crystal are nematic liquid crystals, or by switching the values of angles θ'_j for fixed δ'_j when the liquid crystal are ferroelectric liquid crystals, one generates a detection matrix **A** that is non singular;

choosing a set of reference sample elements comprising a linear polarizer, defined by its Mueller matrix $\mathbf{M}_{pol}$, and first and second dichroïc retarders, said first and second dichroïc

retarders having Mueller matrices $\mathbf{M}_{i=1,2}$ respectively, with approximately known values of the parameters $\tau_{i=1,2}$, $\Psi_{i=1,2}$ and $\Delta_{i=1,2}$; and

for each of the reference sample elements

i) illuminating the reference sample element with the polarized incident light beam emitted by said polarization state generator,

ii) detecting a measurement beam reflected by said reference sample element with an analysis section comprising said polarization state detector and detection means so that for a given set of retardations δ_j, δ'_j or for a given set of orientation angles θ_j, θ'_j, one produces a measured quantity $\mathbf{D_n}$; and

iii) processing the electrical signals produced by the detection means in accordance with the measured quantity $\mathbf{D_n}$ with a processing unit to produce a raw data matrix $\mathbf{B} = \mathbf{AMW}$, where $\mathbf{M}$ is the Mueller matrix of the reference sample element, in particular, the origin of the azimuthal angles (θ=0) being taken in the plane of incidence:

DR_1 alone, set at θ=0, yielding a measured matrix $\mathbf{B}_1=\mathbf{AM}_1\mathbf{W}$,

DR_2 alone, set at θ=0, yielding a measured matrix $\mathbf{B}_2=\mathbf{AM}_2\mathbf{W}$,

DR_1, set at θ=0, and preceded by the polarizer set at an orientation angle θ_1, yielding a measured matrix $\mathbf{B}_{p1}=\mathbf{AM}_1\mathbf{R}(-\theta_1)\mathbf{M}_{pol}\mathbf{R}(\theta_1)\mathbf{W}$, where $\mathbf{R}(\theta)$ is a matrix representing a rotation by an angle θ about the z axis,

DR_1, set at $\theta=0$, and followed by the polarizer, set at an orientation angle θ_2, yielding the measured matrix $\mathbf{B}_{p2}=\mathbf{AR}(-\theta_2)\mathbf{M}_{pol}\mathbf{R}(\theta_2)\mathbf{M}_1\mathbf{W}$;

calculating the products $\mathbf{C}_1=\mathbf{B}_2^{-1}\mathbf{B}_1$ and $\mathbf{C}_2=\mathbf{B}_1\mathbf{B}_2^{-1}$ and then the matrices $\mathbf{N}_1=\mathbf{M}_2^{-1}\mathbf{M}_1$ and $\mathbf{N}_2=\mathbf{M}_1\mathbf{M}_2^{-1}$ through their eigenvalues, which are the same as those of $\mathbf{C}_1$ and $\mathbf{C}_2$;

calculating the products $\mathbf{C}_{p1}=\mathbf{B}_2^{-1}\mathbf{B}_{p1}=\mathbf{W}^{-1}\mathbf{N}_1\mathbf{R}(-\theta_1)\mathbf{M}_{pol}\mathbf{R}(\theta_1)\mathbf{W}$ and $\mathbf{C}_{p2}=\mathbf{B}_{p2}\mathbf{B}_2^{-1}=\mathbf{AR}(-\theta_2)\mathbf{M}_{pol}\mathbf{R}(\theta_2)\mathbf{N}_2\mathbf{A}^{-1}$;

defining a $\mathbf{K}_1$ matrix as $\mathbf{K}_1(\theta_1)[\mathbf{X}]= \mathbf{H}_1^T\mathbf{H}_1 .. \mathbf{H}_{p1}(\theta_1)^T\ \mathbf{H}_{p1}(\theta_1)$, where, for any 4x4 real matrix $\mathbf{X}$, $\mathbf{H}_1[\mathbf{X}]$ and $\mathbf{H}_{p1}(\theta_1)[\mathbf{X}]$ are defined as

$$\mathbf{H}_1[\mathbf{X}]=\mathbf{N}_1\mathbf{X}-\mathbf{X}\mathbf{C}_1 \quad \text{and} \quad \mathbf{H}_{p1}(\theta_1)[\mathbf{X}]=\mathbf{N}_1\mathbf{R}(-\theta_1)\mathbf{M}_{pol}\mathbf{R}(\theta_1)\mathbf{X}-\mathbf{X}\mathbf{C}_{p1} \quad ;$$

determining the modulation matrix $\mathbf{W}$ and the orientation θ_1 by requiring that $\mathbf{K}_1(\theta_1)$ has one vanishing eigenvalue, and $\mathbf{W}$ is the eigenvector associated with this vanishing eigenvalue;

determining similarly the analysis matrix $\mathbf{A}$ as the eigenvector associated with the unique vanishing eigenvalue of the matrix

$$\mathbf{K}_2(\theta_2)[\mathbf{X}]= \mathbf{H}_2^T\mathbf{H}_2\ ..\ \mathbf{H}_{p2}(\theta_2)^T\ \mathbf{H}_{p2}(\theta_2)$$

where for any real 4x4 matrix $\mathbf{X}$

$\mathbf{H}_2[\mathbf{X}]=\mathbf{C}_2\mathbf{X}-\mathbf{X}\mathbf{N}_2$, $\mathbf{H}_{p2}(\theta_2)[\mathbf{X}]= \mathbf{C}_{p2}\mathbf{X} - \mathbf{X}\mathbf{R}(-\theta_2)\mathbf{M}_{pol}\mathbf{R}(\theta_2)\mathbf{N}_2$; and

choosing said reference sample elements according to the following criteria:

the 16x16 real symmetrical matrices $\mathbf{K_1}(\theta_1)$ and $\mathbf{K_2}(\theta_2)$ will only have one vanishing eigenvalue, if and only if the angles θ_1 and θ_2 used for their evaluation are equal to the azimuthal angles of the polarizers during the calibration measurements, and

the next eigenvalues are as large as possible with the ratios $Z=\lambda_{15}/\lambda_1$ of the smallest nonvanishing eigenvalues (λ_{15}) over the largest (λ_1) eigenvalues of $\mathbf{K}_1$ and $\mathbf{K}_2$ are as large as possible.

45. (new) A calibration process according to claim 44, wherein the set of reference sample elements comprises:

a linear polarizer set at $\theta_1=45°+/-5°$

a linear polarizer set at $\theta_2=-45°+/-5°$, and

a couple of reference sample elements equivalent to a first dichroïc retarder and a second dichroïc retarder, both retarders oriented at $\theta=0$ with respect to the incidence plane, with Mueller matrices $\mathbf{M}_1$ and $\mathbf{M}_2$ such that the products $\mathbf{M}_2^{-1}\mathbf{M}_1$ and $\mathbf{M}_2^{-1}\mathbf{M}_1$ are the Mueller matrices of a DR with $\Psi=45°+/-30°$ and $\Delta=90°+/-10$.

46. (new) A calibration process according to claim 45, wherein for a spectroscopic application, said reference sample elements comprise a metallic mirror.

47. (new) A calibration process according to claim 46, wherein for the spectroscopic application, said reference sample elements comprise an achromatic quarter-wave plate, oriented with one axis in the incidence plane placed before or after a metallic mirror.